Universitat Autònoma de Barcelona

2019/2020

Statistics

Code: 103803
ECTS Credits: 6

Degree	Type	Year	Semester
2502441 Computer Engineering	FB	2	1

Contact

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Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Josep Maria Burgués Badía
Laia Saumell Ariño
Antoni Sintes Blanc
Joan Porti Piqué
David Marín Pérez

Prerequisites

There are no prerequisites. It is recommended to have followed the courses in Algebra and Calculus.

Objectives and Contextualisation

The goal of the course is to introduce the basic tools of probability and statistics to analyze data from natural phenomena or experiments, focusing in its correct use and the interpretation of the results. The theory and problem sessions are going to be complemented with practice classes in the computer room, with the aim of using computer tools.

Skills

- Acquire thinking habits.
- Have the capacity to resolve the mathematical problems that can arise in engineering. Have the aptitude to apply knowledge about: linear algebra, differential and integral calculus, numerical methods, numerical algorithms, statistics and optimisation.
- Know the basic materials and technologies to enable the learning and development of new methods and technologies, as well as those that that provide large-scale versatility to adapt to new situations.

Learning outcomes

1. Develop a capacity for analysis, synthesis and prospection.
2. Develope scientific thought .
3. Identify statistical distributions and their application to engineering problems.
4. Know and apply the mathematical methods of deduction and demonstration.
5. Recognise and identify the mathematical models of an engineering problem.
6. Show the knowledge and the capacity to apply basic numerical methods and algorithms.

Content

Topic 1. Descriptive statistics.

Descriptive statistics. Descriptive study in one variable: categorical (sector diagram) and quantitative (mean, deviation, bar diagram and histogram). Descriptive study in two variables: categorical (contingency tables) and quantitative (regression line, correlation coefficient). Software tools for statistical analysis.

Topic 2. Probability.

Notion of probability. Conditioned probability and independence of events. Statistical distributions. Examples of application to engineering. Random variables. Expected value and variance of a random variable. Examples: binomial and normal. Approximation of the binomial to normal. Independence of random variables. Basic notions of stochastic processes, Poisson and exponential distributions.

Topic 3. Statistical inference.

Sample and population. Most frequent statistics. Confidence intervals: for the average and for the variance of a normal population and for the proportion. Hypothesis test. Test for the average and for the variance of a normal population and for proportions. Comparison tests. Pearson Independence Test.

Methodology

There are theory classes (lectures), problem sessions, and practices sessions. In these sessions and with individual work the especific skills are achieved.

New material will be mainly introduced in the lectures, but explanations must be complemented with the autonomous study and personal work of the student, with the help of the references and the material in the CV. There will be a partial test of theory and problems.

The problems sessions will be devoted to the oriented resolution of some proposed problems. Attention will be payed to corection and rigorousness, as well as to vocabulary, mathematical expression and clarity in writing.

In the practice sessions we shall introduce software with applications to statistics (spreadsheets and statistics packages). Descriptive and inferential methodologies are introduced. These tools will be used to solve problems and will be used to work (individually) with real data.

The Campus Virtual UAB is a key tool to follow the class: access to material, check information and following the course.

Transversal skills. The lectures in which mathematical models are discussed, with the problem sessions in which several solutions to problems will be proposed, and with the individual work of the student allow to reach the transversal skills. (T01.02 - Develop a capacity for analysis, synthesis and prospection and T01.03 - Develop scientific thought).

Activities

Title	Hours	ECTS	Learning outcomes

Type: Directed			
Practices in the computer room	12	0.48	4, 6, 1, 3, 5
Problem sessions	12	0.48	4, 6, 1, 3, 5
Theoretical classes / lectures	26	1.04	4, 6, 1, 3, 5
Type: Supervised			
Tutoring and consultations	10	0.4	4, 6, 1, 3, 5
Type: Autonomous			
Independent study and preparation	60	2.4	4, 6, 1, 3, 5

Evaluation

The assessment consists of two modules:

Module I: consist of

a) a initial test to reinforce the knowledge of basic tools to be used along the semester (20%)
b) A final test (40%)
c) A problems session (15%)

Module II: participation and assessment in the laboratory practices.

Finally, during the exams period there will be a test to recover the mark of the whole Module I. Tests (a) and (b) contain a written exercise to guarantee reaching the transversal skills. In order to be able to participate in the compensation test, it is required that the student has followed evaluation activities for a minimum of two thirds of the total mark. Module II is not compensated, in agreement with the coordination of the degree and the direction of the School.

The minimal marks required are 4 out of 10 for Module I (or for its compensation) and for Module II. If the minimum of each module is reached, the final mark is the weighted mean. Otherwise the final mark is the minimum between the weighted mean and 4.5 (out of 19).

Assessment dates will be published on the virtual campus and on the presentation slides, and the programming may change because of adaptation to possible incidents. Any modification will always be informed in the Campus Virtual, which is the usual exchange of information platform between teachers and students.

For the assessment activity, a place, date and time of review will be indicated in which the student will be able to review the activity with the teacher. In this context, claims can be made about the activity grade, which will be graded by the teachers responsible for the subject. If the student does not take part of this review, this activity will not be reviewed later.

In order to pass the course with honors, the final grade must be equal or higher to 9 points. This will be given to students that, according to the criterion of the professors, have reached in a brilliant manner all the goals.

Notwithstanding other disciplinary measures deemed appropriate, and in accordance with the academic regulations in force, assessment activities will receive a 0 score whenever a student commits academic irregularities that may alter such assessment. The assessment activities qualified in this way and by this procedure will not be recoverable. If you need to pass any of these assessment activities to pass the subject, this subject will be failed directly, without opportunity to recover it in the same course These irregularities include, among others:
the total or partial copy of a practice, report, or any other evaluation activity;

to let copy;
to have communication devices (such as mobile phones, smart watches, etc.) accessible during theoretical-practical assessment tests (individual exams).

The students who passed Module 2 the previous year can keep the mark after requiring it by email to joan.porti@uab.cat. None of the marks of the assessment activities of Module 1 from previous year will be kept.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Exercices and problems	15%	10	0.4	4, 6, 2, 1, 3, 5
Practices in the computer room	25%	15	0.6	4, 6, 2, 1, 3, 5
Written test	60%	5	0.2	4, 6, 2, 1, 3, 5

Bibliography

1. Arnold O. Allen, Probability, Statistics, and Queueing Theory with Computer Science Applications, Academic Press, Inc. 1990
2. Jay L. Devore. Probabilidad y estadística para ingeniería y ciencias. Thomson. 2005
3. Rosa Millones, Emma Barreno, Félix Vásquez y Carlos Castillo, Estadística aplicada a la ingeniería y los negocios. fondo Editorial, Universidad de Lima. 2015.
4. Douglas C. Montgomery y George C. Runger, Probabilidad y estadística aplicadas a la ingeniería. Limusa Wiley. 2002
5. Ronald E. Walpole, Raymond H. Myers y Sharon L. Myers. Probabilidad y estadística para ingenieros. Prentice Hall. 1999